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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/084,194 | 02/28/2002 | Peter Wrschka | 2001 P 14591 US | 4927 |
| 25962 | 7590 | 12/16/2004 | EXAMINER | |
| SLATER & MATSIL, L.L.P. 17950 PRESTON RD, SUITE 1000 DALLAS, TX 75252-5793 | | | ESTRADA, MICHELLE | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2823 | |

DATE MAILED: 12/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/084,194

Applicant(s)

WRSCHKA ET AL.

Examiner

Michelle Estrada

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 16 is/are rejected.
- 7) ☒ Claim(s) 7-14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2/28/02, 10/25/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of the first species (claims 1-14) in the reply filed on 10/25/04 is acknowledged. Applicant canceled claim 15 and added new claim 16.

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 2/28/02 and 10/25/04 have been considered by the examiner.

Drawings

Figures 1A, 2A and 3A should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koyanagi et al. (6,037,278) in view of Funkenbusch (2002/0074311).

With respect to claim 1, Koyanagi et al. disclose a method of planarizing a semiconductor wafer comprising: filling gaps (spaces between metal lines 102/103/104/105) between metal lines (102/103/104/105) formed on a wafer (101) by depositing HDP fill on top of the metal lines and between the metal lines to create an HDP overfill (Col. 7, lines 7-30 and Fig. 3b); and planarizing the insulating fill by chemical mechanical polishing to reach the endpoint and an uniformly planar surface on

the wafer sufficiently close above the metal lines and yet far enough away from said lines to prevent damage to said lines (See fig. 3c).

Koyanagi et al. do not disclose contacting the surface of the HDP overfill with a fixed abrasive polishing pad; and relatively moving said wafer and said fixed abrasive polishing pad to affect a polishing rate sufficient to reach a predetermined endpoint.

Funkenbusch discloses planarizing a semiconductor wafer using chemical mechanical polishing with a fixed abrasive polishing pad by contacting the surface of a layer being polished with the abrasive polishing pad; and relatively moving said wafer and said fixed abrasive polishing pad to affect a polishing rate sufficient to reach the endpoint and a substantially planar surface on the wafer wherein the damage to the underlying layer below the layer being polished can be prevented.

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Koyanagi et al. and Funkenbusch to enable the fixed abrasive polishing technique of Funkenbusch to be performed in the process of Koyanagi et al. because a better semiconductor device will be obtained without the damage to the metal lines by using the fixed abrasive polishing for better detection of the endpoint. Furthermore, detection of the process endpoint is critical for achieving optimum processing (Page 2, Paragraph [0011]).

With respect to claim 2, Koyanagi et al. disclose wherein the metal lines (102/103/104/105) are selected from the group consisting of titanium, aluminum and copper mixture and titanium mixture thereof (Col. 7, lines 7-15).

Claims 3 and 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koyanagi et al. (6,037,278) in view of Funkenbusch (2002/0074311) as applied to claims 1 and 2 above, and further in view of Meikle (5,795,495).

The combination of Koyanagi et al. and Funkenbusch does not disclose wherein said metal interconnect lines are aluminum; and depositing HDP on the surface of a dielectric layer.

With respect to claim 3, Meikle et al. disclose wherein the conductive lines are aluminum.

With respect to claim 16, Meikle et al. disclose filling gaps between conductive lines (24) of an inter metal dielectric in a wafer being formed, by depositing an insulating fill on top of the conductive lines, between the conductive lines, and on the surface of a dielectric (22) (Col. 4, lines 46-51).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Koyanagi et al., Funkenbusch and Meikle et al. to enable the aluminum material and the dielectric material of Meikle et al. to be used in the process of Koyanagi et al. and Funkenbusch because they are alternate suitable materials in the production of such a device as taught by Meikle et al.

Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koyanagi et al. (6,037,278) in view of Funkenbusch (2002/0074311) as applied to claims 1 and 2 above, and further in view of IM (2003/0029212).

The combination of Koyanagi et al. and Funkenbusch does not specifically disclose wherein said metal lines are titanium, copper or tungsten.

With respect to claims 4-6, titanium, copper and tungsten are known material for forming metal lines. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co., Inc.v. International Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw puzzle." (65 USPQ at 301). See IM (Paragraph [0069]) as evidence that shows the usage of metal lines (52) of aluminum, copper, tungsten or titanium. Therefore, it would have been obvious for those skilled in the art, in view of IM, to select aluminum, titanium, copper or tungsten as known materials for forming the metal lines into the process of Koyanagi et al. in view of Funkenbusch to provide appropriate electrical conductive path of the metal lines as a demand of a device being needed.

Allowable Subject Matter

Claims 7-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: there is no disclosure in the prior art of said predetermined endpoint on the wafer being about 50 nm or less than 50 nm.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Estrada whose telephone number is 571-272-1858. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2800.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Michelle Estrada". The signature is fluid and cursive, with the first name "Michelle" being more prominent than the last name "Estrada".

Michelle Estrada
Examiner
Art Unit 2823

ME
December 2, 2004